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The AMERICAN JOURNAL of OPTOMETRY

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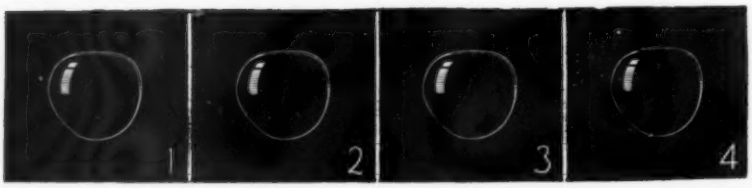

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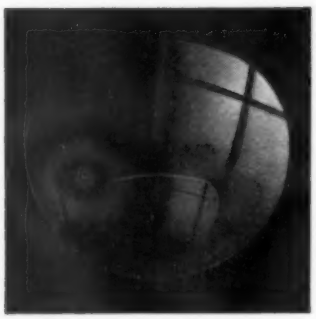

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THE IMPORTANCE OF THE CORRECTION OF OCULAR DEFECTS IN A REMEDIAL READING PROGRAM. RESULTS OF RECENT RESEARCH*

Brant Clark
Psychology Laboratory, University of Southern California, Los Angeles, California

Dr. Elizabeth L. Woods, of the Los Angeles City Schools, Department of Research, in a recent paper, "Research needs in the kindergarten-primary field" (14), makes the following statement: "We need to know whether the claim is true that we are seriously impairing the eyesight of the race by permitting children of 5, 6, or 7 to use their eyes in the fine co-ordinations of reading." Dr. Woods believes that this is one of the outstanding problems in elementary education today. This is a good illustration of the stress which is now being placed upon the importance of physiological and psychological factors in relation to the problem of reading disability.

Obviously, the problem of reading is a most complex one, and it is dangerous to place too much emphasis on any one aspect of it. Some of the factors which must be considered are: general physical, physiological, and psychological maturation, audition, language difficulties, sex differences, speech defects, hand writing, emotional factors, as well as numerous external influences such as illumination. However, it is true that our present educational system is based fundamentally on the use of the eyes, and that is the particular aspect of reading disability which I wish to discuss with you this afternoon. It can probably be done best by reviewing some of the recent research in this field. This review does not pretend to be exhaustive, but it will give a good sample of the type of work which is now being carried on.

When educators first recognized the difference between reading disability and poor reading caused by mental deficiency, a very important step forward was made in elementary education. The study of the importance of certain visual functions in relation to reading has been a direct outgrowth of this movement as well as the failure of certain

*An abridgement of a paper presented before the California State Association of Optometrists, Sacramento, California, February 21, 1935. Submitted for publication March 26, 1935.

standard educational tests to solve the problem for the reason that they are fundamentally concerned with symptoms rather than causes. One of the outstanding investigators in this field is Dr. T. H. Eames. He has made a study of the ocular characteristics of unselected and reading disability groups (6). Two groups of children were used. The first group consisted of 114 children having reading disabilities, the second, the control group, was made up of 143 unselected children. Both groups were tested for visual acuity, heterophoria, adduction, abduction, and refractive error. The results of the tests of refractive error differed so slightly for the two groups that a special study of this function was planned. It was found that there was a tendency for the reading disability group to exhibit poorer vision, greater exophoria at distance and near, and lower ductions. However, the differences between the two groups were not statistically reliable. In fact, Eames believed that the principal finding of the study was the greater exophoria at the near point in the reading disability cases. This will be discussed at length below.

Eames (7) also studied low fusion convergence as a factor in reading disability. A reading disability group of 88 children was studied as well as a control group of 52 children. The test used was the ON-NE fusion test. Both fusion and "break" convergence were measured. It was found that three-fourths of the reading disability group fell below the average of the control group, and the author concludes, "The amplitude of fusion convergence is an important factor in reading disability." He also found that the fusion convergence increased with the size of the test letter showing the value of large types in reading disability cases.

In another article Eames (8) makes the following summarizing statement:

> "A study of the ocular characteristics of a group of 64 reading disability cases, compared with those of a class of 87 unselected school children, indicates the degree and frequency of errors of refraction are not strikingly different, but the reading disability group presents more exophoria, especially at the reading distance, and the amplitude of fusion convergence is about one-half that of the unselected group. . . . I see no value of correction of errors of less than 0.50 D. unless comfort and vision are both improved."

Selzer (12) in an extensive monograph, "Lateral dominance and visual fusion," also made a study of the lateral imbalances of a reading disability group and unselected cases. He found that 90% of the reading disability cases examined at the laboratory had "eye muscle imbalance," whereas only 9% of the unselected cases had the same error, although he does not clearly define what he considered a "muscle imbalance." On the basis of his findings he feels justified in concluding:

> "These conditions of muscle imbalance and alternating vision, in addition to the lack of fusion, the writer believes, account for such reading disabilities as are not accounted for by general mental disability."

This statement is certainly a strong one and can hardly be completely justified when one considers the many factors which are involved in the reading act. Selzer also believes on the basis of his findings that there is a rather definite relationship between lateral muscle imbalance and mirror reading as well as the type of reading disability characterized by reversing the order of letters, omitting letters, and supplying letters not needed. He believes further that reading disability can be decreased by wearing prisms which correct the imbalance. Undoubtedly a better procedure would be to use methods which would lead to better binocular co-ordinations.

Although Selzer is in all probability over-emphasizing the importance of binocular imbalances, they certainly must be considered as an important factor in remedial reading. Betts (1) reports some data which are pertinent to this problem in relation to the physical maturation of children. He studied the change in interpupillary distance with age. The interpupillary distance of school children of various ages was carefully measured using an interpupillary distance gage, and the average growth for each year was determined. It was found that the greatest increase in interpupillary distance occurred during the sixth year. It is important to note that this is the year when the child normally begins to use his eyes in the fine co-ordinations of reading. This is very important in regard to the point raised by Dr. Woods, i.e., when is the child matured to the point where he is ready to begin to read? This question is certainly an open one at the present time and is well worth a great amount of serious consideration.

Probably the most extensive study of the influence of visual factors on reading which has been made recently was that completed by Farris (10) last year. The purpose of this study was to determine whether or not visual defects influence the achievement in reading of school children in the Oakland City Schools; group mean intelligence quotients and chronological ages being approximately equivalent. The study was made over a period of one year and included the examination of 1,685 pupils of the Oakland City Schools. The data were obtained from the files of the Department of Research for the intelligence and achievement tests. The tests used were the Stanford Achievement Test in Reading and the Kuhlmann-Anderson Intelligence Test. The visual tests were made under the immediate direction of the Division of Optometry, University of California, Berkeley. The tests and interpretation were made through the co-operation of Dr. Ralph S. Minor, Dr. F. L. Mason, and Dr. E. A. Coe. The following visual tests were made: acuity of vision for each eye, phoria test, accommodative convergence test, state of refraction as determined by static skiametry, Ishihara test for color perception, amplitude of accommodation, and case history. Farris' results may be briefly summarized as follows:

1. Hyperopia and strabismus retard reading.
2. Myopia and myopic astigmatism contribute to progress in reading.

3. Pupils who have monocular visual perception make progress in reading which is superior to the progress of those having two eyes.
4. Minor eye defects have but little effect on progress in reading. In other words, students with eye defects are not physiologically handicapped.
5. Corrective lenses are aids to achievement in reading.
6. The universally accepted standard of eye structure (emmetropia) does not necessarily imply superiority in reading efficiency.

One point which should be emphasized in relation to these results is the fact that with two or three exceptions, i.e., the inferiority of hyperopes, the superiority of myopes, and the improvement of individuals after ocular defects had been corrected, all of Farris' differences show very low reliability, and although we would like to be able to say that by such a relatively easy method as correcting refractive errors we could cause reading improvement in a majority of cases, this cannot be done unless we carefully pick the refractive errors. Farris' results also indicate that individuals having muscular imbalances make greater improvement in reading than do "normal" individuals. This is directly opposed to the findings of Eames (6, 8), and Selzer (12), but the reliability of Farris' difference is quite low so that it cannot be considered to be significant. Undoubtedly Farris' results could only be expected to show low correlations with reading achievement because of the fact that unless certain aspects of this very complex process are isolated, its very complexity will hide any high correlation with any specific factor.

Eames (9) has also studied the effect of the correction of ocular defects of non-readers. He tested 28 cases at the beginning of the school year, and soon after this all of the eye defects which were discovered were corrected. A reading test was given at the beginning of the year and at the end of a seven-month period. The improvement of this group was compared with that of an unselected group. The results showed that there was a greater improvement in the corrected group, and that it was statistically significant. Eames believes that the correction of eye defects is very important in the treatment of reading disability cases, and that non-readers can be expected to exhibit normal progress after the correction of eye defects and fusional deficiencies.

Schmidt (13) showed in 1917 that, during interfixation movements and especially during the return sweep from the end of one line to the beginning of the next, the eyes make upward and divergence movements which requires downward and convergence movements during the fixation pause. The possible importance of these movements has been indicated by the recent work of Eames (68), and Selzer (12). (vide supra) Clark (5) recently made a study of the effect of high exophoria on the behavior of the eyes during reading. It was the purpose of this study to attack the problem using the method of eye movement photography.

Twenty-two subjects were studied and were paired as to sex and score in reading comprehension and linguistic ability from the Thorndike Intelligence Examination for High School Graduates, Form B, but one group exhibited high exophoria (12△ —16△) while the other exhibited low exophoria at the near point (0-3△). The high exophores fell in the highest 9% of an unselected group studied by Clark (4). The eye movements were photographed, using a camera (3) which recorded the horizontal and vertical movements of both eyes on a single record with high magnification.

A comparison of the eye movement records of individuals having "normal" binocular balance with those of the exophoric group led to the following conclusions: There was no significant difference between the two groups in regard to the number and duration of fixations and regressions. The results corroborated those of Schmidt in showing upward movements during the return sweep, but convergence rather than divergence movements occurred, requiring downward and divergence movements during the fixation pause. These divergence movements were made by the subjects after every return sweep. In the time required to complete the divergence movements at the beginning of the lines, 65% of the subjects made significantly greater divergence movements with the non-dominant eye, but there was no significant difference in the time required to make these movements. The exophoric group made greater divergence movements on the average and the difference between the two groups was probably significant. These divergence movements undoubtedly cause enough reading fatigue to be of considerable importance from the point of view of remedial reading. They also show that the eyes are being "exercised" continuously during the reading act, and that ocular exercises should be given with something definite in mind rather than to exercise the ocular muscles.

Of course the person who is primarily interested in methods of improving reading is the elementary school teacher, and any defect which will retard reading achievement should be made known to her. One important reason for this is given by Betts (2). He says:

> "It is imperative that a teacher should not 'drive' a child until she has made an attempt to analyze or define the problem. Our records show that 90% of the severe reading cases should have medical attention before receiving pedagogical help. In such instances, tutoring aggravates the problem, and many times an apparent gain in reading achievement is due to maturation rather than the pedagogical method used."

Betts in his work at the Shaker Heights Reading Clinic has attempted to correlate disabilities of physical structure with reading disabilities. At this clinic a great variety of tests has been devised and administered. It will perhaps be worth while to discuss the value of the visual tests which Betts has devised because they are without doubt of considerable value in spite of certain limitations. The outstanding value of these tests is that

they are relatively easy to administer. They can be placed in the hands of a school teacher, and she can with a relatively small amount of training discover the presence of certain ocular defects which are of importance to her in her work.

Probably the chief disadvantage of the test battery is the lack of complete standardization. The tests are based solely on measurements made through a stereoscope, and the meaning of the findings in relation to certain standard ocular tests is not entirely clear. One example will explain this. Lauer (11) at Iowa State College has used the test in his work with automotive drivers. He found a correlation of —0.0366 between acuity measured by the stereoscopic technique and standard optometric techniques, indicating marked differences between the two tests. The reason for this is undoubtedly due to the fact that this test is based on the discrimination of one symbol at each acuity level. It amounts to measuring visual acuity with one letter in place of the customary line of letters. However, this can probably be overcome either by modifying the test or the testing procedure.

This brief summary of current literature on the relation of eye defects to reading disability shows quite clearly that it is an open field for investigation. On searching the literature one is very much surprised to note the small number of papers in this field. At the present time there are several investigators working on this problem and doubtless within a short period of time more reports will appear and help to clarify the present somewhat obscure picture.

DR. BRANT CLARK,
PSYCHOLOGY LABORATORY,
UNIVERSITY OF SOUTHERN CALIFORNIA,
LOS ANGELES, CALIFORNIA.

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A CASE OF KERATOCONUS*

H. Leslie Salov, Opt.D.
Newark, N. J.

Patient:

Mr. F. S., age 32, seen in consultation with Dr. John Wirth, of Elizabeth, N. J. Subnormal vision for the last ten years. Was compelled to give up his occupation of machinist due to his very poor vision. Has had all kinds of ocular treatment, medical and optometrical; but with no improvement in the condition of his eyes. Can only read large headlines in newspapers.

Fig I.

*Submitted for publication April 11, 1935.

Fig. II.

External Examination:

Naked visual acuity—Right eye, 20/50; left eye, 20/200. Conical cornea of both eyes, more marked in the left eye.

Slit-Lamp Investigation:

Lenticular cortex involvement in the right eye. Involvement of the stroma layer of the cornea of the left eye.

It was our opinion that the use of the contact lens would be helpful to improve the patient's subnormal vision. The patient was instructed that his case would be kept under observation to determine whether it would be advisable to design a contact lens for one or both eyes. We inserted contact lens in left eye with two drops of Butyn and the visual acuity was improved to 20/50. Left lens in for five minutes and examined the cornea under the slit-lamp. Removed lens and inserted in right eye. Some slight improvement in visual acuity.

Observational Period:

12/8—Contact lens filled with saline solution, inserted in left eye with 2% Butyn. Patient reported no discomfort. Removed lens after

fifteen minutes. Inserted in right eye with Butyn. Patient reported vision foggy, due to lenticular involvement.

12/13—Inserted lens in left eye with Butyn after three trials. Patient said lens felt tight but after a few minutes reported comfortable. Removed lens after a half hour.

12/27—Inserted lens with Butyn in both eyes. Patient mentally disturbed, visual acuity irregular. Not good reaction, especially due to interference of involvement in the crystalline lens of the right eye. Removed lens from right eye. Examined left eye with slit-lamp and took visual acuity with contact lens 20/40. Read small newspaper print.

Photograph No. 1, front view of binocular conical corneae.

Photograph No. 2, side view of condition of left eye.

From our observation, it was our opinion that this patient could be helped by the introduction of a contact lens, in the left eye only. We designed a lens for that eye.

12/31—Inserted contact lens with Butyn at 2:15 in the afternoon. No discomfort. Removed lens at 3:30. Slight injection. Used two drops of Adrenaline Chloride.

Fig. III.

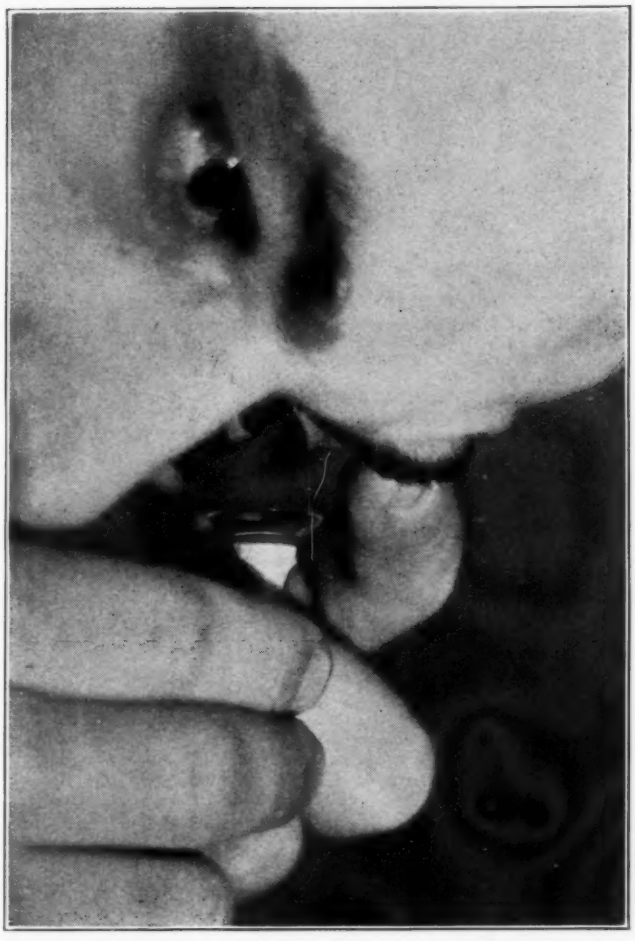

Fig. IV.

1/ 2—Inserted lens in left eye without Butyn at 10:45 in the morning and removed it at 12:45. No discomfort or redness.

1/ 5—Patient inserted lens without Butyn in left eye after three trials. Patient delighted at being able to insert it himself. Removed lens after having worn it for four hours.

1/10—Patient practised inserting and removing lens for two hours. He did quite well.

1/15—Patient inserted lens in left eye in the morning at 10:00 o'clock and went home. He reported that the members of his family didn't know that he was wearing the lens until he told them at the dinner table. Came back to the office at 5:00 o'clock and removed the lens. Slight injection.

1/19—Patient inserted lens in left eye at 9:30 A. M. Went home and reported back at 5:30 P. M., and we took his visual acuity. It was 20/25. Read newspaper for a half hour and then removed lens.

Photograph 3, patient wearing contact lens.

Photograph 4, technique of inserting contact lens.

The patient now wears the contact lens ten hours a day. He can read fine newspaper print, drive a car, enjoy a screen and stage show, can do fine repairing on automobiles.

Appreciation is extended to Dr. William Feinbloom, of New York, for his helpful advice.

DR. H. LESLIE SALOV,
28 JAMES STREET,
NEWARK, NEW JERSEY.

THE DISTRIBUTION OF THE TONIC RECIPROCAL INNERVATION TO THE EXTRA-OCULAR MUSCLES IN OVER TWO THOUSAND CLINICAL PATIENTS*

W. O. Vivian, O. D.
Media, Pa.

The purpose of this paper is to show the distribution of the tonic reciprocal innervation at both distance and near in a considerable number of clinical patients. In order to furnish this data the 'phorias of over two thousand selected patients in the clinics of the Pennsylvania State College of Optometry were recorded with great care.

For many years there has been much confusion and many opinions regarding the ocular muscle balance condition could be described as "normal" or "optional" for a given individual, but so far as the writer can determine, no real effort has been made to record the distribution of the actual balance conditions in a large number of persons who apparently have no asthenopia resulting from so-called extra-ocular muscle anomalies. An approximate idea of the possible variations in 'phorias without asthenopic symptoms would make it possible to judge, in a given case, the degree of imbalance which could be tolerated and compensated for without discomfort. If the individual results lie within the area of greatest distribution obtained by the group survey, the probabilities are that asthenopia from imbalance of the extra-ocular muscles will not be present.

This is especially true in dealing with near point muscle test data, as for years we have been led to expect 4 prism diopters to 6 prism diopters of exophoria at near in so-called normal cases, and when greater exophoria was manifest, considered it an indication of general or ocular fatigue.

As a statistical approach to the problem, twenty-one hundred and seventy-two (2,172) cases were tabulated for the distant 'phorias and twenty hundred and ninety-five (2,095) cases for the near point.

The subjects were, in all cases, patients who had been previously

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*An abridgement of the material presented before the American Academy of Optometry at Baltimore, December 19, 1933.

carefully refracted and corrected and who had no apparent ocular discomforts or difficulties. They therefore formed a group which would be entirely comparable to the same number of normally emmetropic individuals if such could be found. The average refractionist expects to find orthophoria or slight exophoria for distance in the patient with ocular comfort, and if there is any deviation from this condition he immediately feels that either excessive accommodation, abnormal convergence conditions, or both, are present, and is often led to suggest the presence of a ciliary hypertonus or general pathology when, as a matter of fact, neither are present.

The position of the two visual axes in relation to each other is, of course, entirely dependent upon the way in which the innervation to the extra-ocular muscles is distributed. While the actual distribution of contractile energy or inhibition to each muscle of the group must be in accord with the principles of reciprocal innervation, the relationship of the two monocular groups to each other is dependent upon the various types of convergence stimulations.

If the fusional convergence stimulus is removed by dissociation, the convergence status is dependent upon either basic tonic, accommodative association, or proximal stimuli.

In persons wearing adequate refractive corrections, the accommodative association is, as a rule, eliminated, while the proximal is not a factor at distance, leaving, therefore, the basic tonic stimulus as the only one in use. The balance values found for distance, therefore, represent in practically all cases the present status of the basic tonic reciprocal innervation distribution.

At near, the basic tonic innervation is usually modified by the presence of accommodative or proximal stimuli. Including the proximal in the accommodative, as may be done for practical purposes without introducing much error, the variations in 'phorias for near may be considered as the basic tonic innervation plus the accommodative.

The data was obtained by dissociating the 6/60 meter letter E at a distance of nx meters of 6 prisms base down before the right eye, and attaining vertical co-incidence with prisms base-in or base-out before the left eye.

At near, the same method was used with fixation upon a 3 m/m E on the near point test chart at a third meter distance.

In both cases illumination and other variable factors were controlled as far as possible in order to have identical stimulus conditions through the whole series of tests.

In the near point procedure, sufficient time was given to permit the "settling" of the two images which in many cases tend to oscillate or vary during the early part of the test.

Results:

Table I

	Types	No. of Cases	Percentage
Eso	6	31	1.4
	5	32	1.6
	4	103	4.5
	3	90	4.1
	2	214	9.6
	1	135	6.6
	0	865	39.0
Exo	1	172	8.0
	2	275	14.0
	3	100	4.6
	4	114	5.0
	5	14	.6
	6	27	1.2

Distribution of Distance 'Phorias in 2,172 cases.

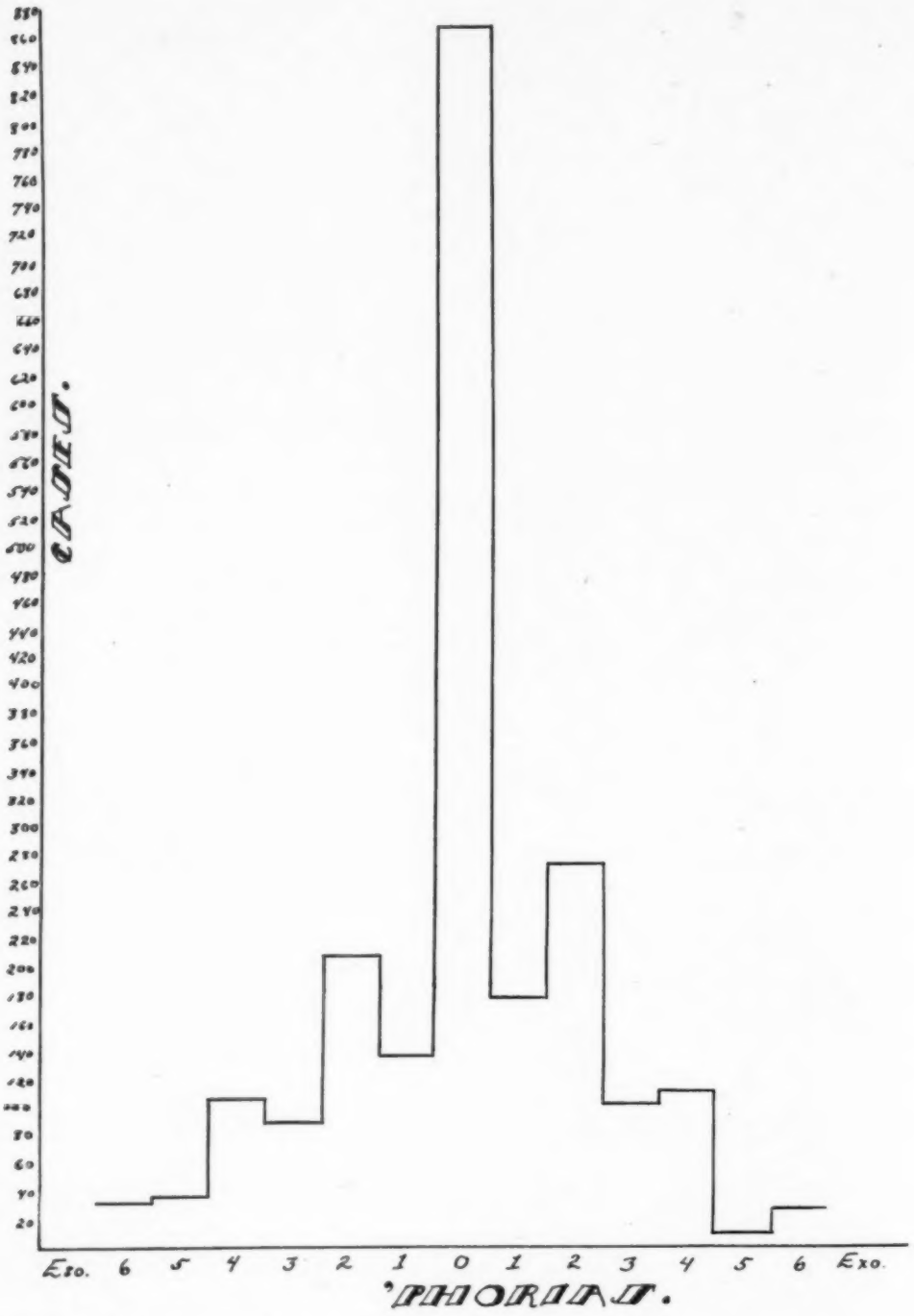
Eso 2 to 2 Exo Tonic Normally

Table II

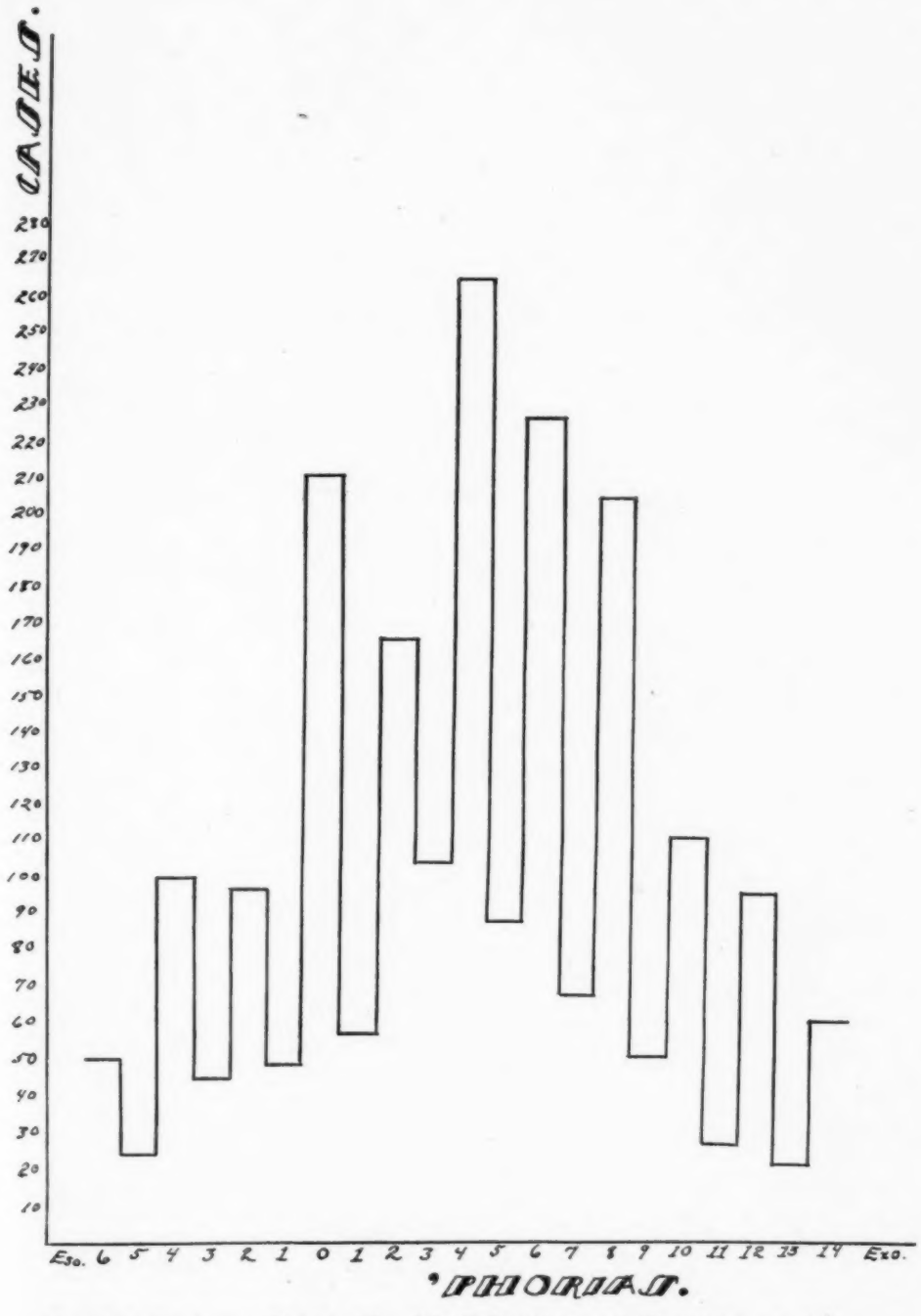
	Type	No. of Cases	Percentage
Eso	6	50	2.48
	5	22	1.05
	4	100	4.77
	3	42	2.00
	2	97	4.63
	1	46	2.14
	0	210	10.00
Exo	1	53	2.52
	2	167	7.97
	3	102	4.86
	4	263	12.5
	5	89	4.24
	6	223	10.6
	7	69	3.29
	8	205	9.78
	9	49	2.33
	10	110	5.25
	11	23	1.09
	12	96	4.58
	13	19	.90
	14	60	2.38

Distribution of 'Phorias at 1/3 meter in 2,095 cases.

3° Eso to 14 Exo
Variance in Acc — Conv
reflex



Dr W.O.Vivian. Chart I. Distribution of Distance Phorias in 2172 cases.



Dr W.O.Vivian. Chart II. Distribution of Phorias at 1/3 meter in 2095 cases.

Results:

The distribution of the 2,172 cases with respect to the tonic reciprocal innervation at distance will be found in Table I. It will be noticed that 39%, or 865 cases, showed an orthophoric condition to exist at distance. Also of equal importance it is noteworthy that 78%, or 1,561 cases, fell in what may be termed the area of greatest distribution, which varied to 2 prism diopters on either side of orthophoria.

The distribution of the 2,095 cases in respect to the near point 'phoria will be found in Table II. The distribution of the cases at near presented an entirely different picture as compared to those at distance. The greatest number of cases of any one 'phoria at near showed only 12.5% of the total. This percentage was distributed rather equally from orthophoria to 10 of exophoria and even beyond that amount there was not an abrupt falling off in numbers.

Graphically, an outstanding modal curve was shown at distance, since 39% of all the subjects had orthophoria. On the other hand, the near point graph showed a definite regularity of distribution over the whole possible area of allowances were made for the inequalities introduced by the apparent predilection of the examiner for even numbers.

Discussion:

It is apparent from our results that a great majority of our subjects had their tonicity distributed so that their visual axes were kept nearly parallel for distance by the tonic balance alone. It is also apparent that any such scatter of data as we have in this report would indicate that 80% at least of the whole group falls into the so-called area of distribution—at least at the time and under the condition of the test—and of the remaining 20%, we find many of these perfectly comfortable with higher amounts of exophoria, or esophoria. From a diagnostic standpoint the significance of the 'phoria value at distance applies only to a small percentage of the cases.

The near point 'phorias do not have any apparent diagnostic significance, since the cases were quite equally distributed from 2 prism diopters of esophoria to 14 prism diopters of exophoria. This even distribution throughout the near point range is undoubtedly due to the variance in the accommodative-convergence reflex which causes the near point findings to vary.

The distribution of the near point data is characteristic of the type of scatter obtained in any large group in the measurement of the effects of learning processes.

This leads to the conclusion that accommodative-convergence is the result of a learning process and that the amount of the reflex has no relation to ocular efficiency or comfort.

Conclusions:

1. Variations in distance 'phorias within the limits of 3 eso-

phoria to 3 exophoria have, in most individuals no diagnostic value as far as accommodative stress or general pathological processes are concerned. The variations indicate, for the most part, only the present status of the tonic reciprocal innervational distribution to the extra-ocular muscles when the fusional convergence modifications are eliminated.

2. Variations in near 'phorias are, for the most part, determined by the extent of the accommodative-convergence reflex which is an association motor reflex, developed as a sub-liminal learning process, and called into action only when the fusional convergence has been eliminated. Such variations in the near 'phoria values have, therefore, no diagnostic significance as far as ocular efficiency or comfort are concerned.

DR. WILLIAM O. VIVIAN,
MEDIA, PA.

REPORT
RED-FREE GLASS IN CERTAIN CATARACT CASES*

E. LeRoy Ryer, Opt. D., F. A. A. O.
and
Elmer E. Hotaling, Opt. D., F. A. A. O.
New York, N. Y.

The first seventy-six cases in the following report are from an original 100 cases of incipient or advanced cataract where red-free lenses have been prescribed either in prescription or in zero power and worn constantly for distance and reading. These cases range in time of observation from January, 1925, to December, 1933, and have been examined by us from three to eleven times over that period. These cases were not chosen to prove a point, but are average in results taken from several hundred. The remaining twenty-four case reports were added to make up this report of 100 cases, but were not cases reported by us in our last tabulation made before the American Academy in 1930.[1]

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*An abridgement of the material presented before the American Academy of Optometry at Baltimore, December 19, 1933.

[1]Dr. Elmer E. Hotaling of 9 East 42nd St., New York City, assisted by his associate, Dr. E. LeRoy Ryer, has served for the past six years as Chairman of a Commission appointed by the American Academy of Optometry to investigate the possibilities of the use of Red-free Glass in certain cases showing lenticular opacities. The work of this commission is by no means finished, the material found on the following pages being part of a report presented by this commission. Previous reports are as follows:

(1) Red-free Lenses in Cataract Prophylaxis. Vol. IV. Amer. Acad. of Optom., pp. 127-132. 1929.

(2) Report. Red-free Lenses in Certain Cataract Cases. Vol. V. Amer. Acad. of Optom., pp. 80-88. 1930.

CASE	CASE STARTED WITH RED-FREE LENSES	AGE	Number of Examinations		Visual Acuity without Rx. at First Examination	Visual Acuity with Red-Free Rx. at First Examination	Visual Acuity without Rx. at Last Examination	Visual Acuity with Red-Free Rx. at Last Examination	Year of Last Examination
1.	Jan. 18, '29	27	9	R.	.85—	.85	.85—	.85+	1933
				L.	.85	.85+	.85	.85+	
2.	Apr. 9, '29	53	5	R.	.85	1.00	.85+	1.00+	1932
				L.	—	.12	.30	.85+	
3.	Dec. 14, '28	45	4	R.	.60	1.00	.85	1.00	1933
				L.	.60	1.00	.85	1.00	
4.	Apr. 5, '27	35	7	R.	.08	.50—	.25	.50+	1933
				L.	.85	.85	.85	1.00+	
5.	Feb. 7, '28	26	10	R.	.60	.85+	.85	1.00+	1933
				L.	.30	.40+	.50	.60+	
6.	Jun. 29, '26	56	6	R.	.85	.85+	.50	.85+	1932
				L.	.85	.85+	.60	.85+	
7.	Aug. 28, '29	62	5	R.	—	.85+	—	.85+	1933
				L.	—	.85+	—	.85+	
8	Jun. 28, '27	41	5	R.	.30—	.85—	.18—	1.00—	1931
				L.	.30	.85—	.18—	.85—	
9.	Sep. 17, '28	43	4	R.	.30—	1.00—	.12—	.85+	1933
				L.	.18	1.00—	.12+	.85+	
10.	Nov. 26, '28	38	5	R.	.85—	1.00	.85	1.00—	1931
				L.	.60+	1.00	.85	1.00—	
11.	Jan. 12, '26	63	8	R.	—	.85—	—	.60+	1933
				L.	—	.85—	—	.60+	
12.	Feb. 23, '28	49	8	R.	—	.85+	—	.85+	1933
				L.	—	.85+	—	.85+	
13.	Apr. 3, '26	73	5	R.	.30	.85	—	.85+	1931
				L.	.30	.85	—	.50	
14.	Nov. 4, '25	66	11	R.	.30	.70	.40—	.30	1933
				L.	.30	.70	.50+	.50	
15.	Jul. 7, '26	63	5	R.	—	.85	.08	1.00	1933
				L.	—	.85	.08	1.00	
16.	Oct. 19, '25	60	8	R.	—	.85	.08	.85	1933
				L.	Operated	—	—	—	
17.	Feb. 14, '28	52	5	R.	.85	.85	.85	.85+	1933
				L.	.40+	.85	.50	.85+	
18.	May 15, '28	75	5	R.	.25	.50	.50+	.50+	1931
				L.	.18	.50	.08	.50+	
19.	Jan. 11, '26	56	5	R.	.30	.85	.40	1.00	1931
				L.	.30	.85	.30	1.00	

CASE	CASE STARTED WITH RED-FREE LENSES	AGE	Number of Examinations		Visual Acuity without Rx. at First Examination	Visual Acuity with Red-Free Rx. at First Examination	Visual Acuity without Rx. at Last Examination	Visual Acuity with Red-Free Rx. at Last Examination	Year of Last Examination
20.	May 14, '26	66	8	R.	—	.85	.25	.85+	1933
				L.	—	.85	.12—	.85+	
21.	Sept. 19, '29	17	8	R.	.85	1.00	1.00	1.00	1933
				L.	.18	.85	.30	1.00—	
22.	Apr. 22, '26	61	7	R.	.18	.85+	.25	.50+	1933
				L.	.25	1.00—	.30—	1.00—	
23.	Mar. 1, '26	45	6	R.	—	.85	—	.85	1931
				L.	—	.85	—	.85	
24.	Jul. 1, '26	81	4	R.	.25	.40+	.08	.50+	1933
				L.	.04	.40+	.08	—	
25.	Oct. 24, '25	55	7	R.	.50—	.85	.50+	.85+	1933
				L.	.50—	.85	.50+	.85+	
26.	Oct. 14, '25	70	8	R.	—	.30	—	.25+	1932
				L.	—	.30	—	—	
27.	Feb. 11, '26	58	8	R.	.30	.85	.40	.85+	1933
				L.	.30	.85	.40	.85+	
28.	Sept. 15, '26	77	5	R.	.08	.85—	.30+	.60+	1932
				L.	.08	.85—	.18	.60+	
29.	Apr. 5, '27	71	7	R.	—	.85	—	.50—	1933
				L.	.25	.85	.50+	.50—	
30.	Nov. 18, '26	65	6	R.	.60	.85	.50	.85+	1933
				L.	.60+	.85	.50	.85+	
31.	Nov. 20, '25	46	4	R.	.85	.85	.60	.85+	1932
				L.	.85	.85	.60	.85+	
32.	May 4, '26	44	7	R.	.50	.85—	.85—	1.00+	1932
				L.	.60	.85	.60—	1.00+	
33.	Mar. 16, '26	75	5	R.	—	.85	—	.85	1932
				L.	—	.85	—	—	
34.	Jun. 1, '26	32	10	R.	—	.60	—	.60+	1933
				L.	—	.60	—	.60	
35.	Jul. 9, '25	33	8	R.	—	.85+	—	1.00+	1932
				L.	—	.85+	—	1.00+	
36.	Apr. 12, '26	70	9	R.	.85	.85	.85	.85	1933
				L.	.85	.85—	.85—	.85+	
37.	May 28, '26	52	8	R.	.30	.60+	.25—	.85	1933
				L.	.25	.60+	.25+	.85	
38.	Jan. 22, '26	66	4	R.	—	.60+	—	.30	1933
				L.	.35	.85+	.40—	1.00	

CASE	CASE STARTED WITH RED-FREE LENSES	AGE	Number of Examinations		Visual Acuity without Rx. at First Examination	Visual Acuity with Red-Free Rx. at First Examination	Visual Acuity without Rx. at Last Examination	Visual Acuity with Red-Free Rx. at Last Examination	Year of Last Examination
39.	Jan. 17, '29	63	7	R.	.08	.85	.08—	1.00—	1933
				L.	.08	.85	—	1.00—	
40.	Dec. 10, '26	51	5	R.	.85	1.00	1.00	1.00	1932
				L.	.85	1.00	1.00	1.00	
41.	Aug. 23, '26	63	5	R.	.25	1.00+	.12	1.00—	1931
				L.	.25	1.00+	.25	1.00—	
42.	Mar. 1, '26	42	9	R.	.40	.85	.85	.85+	1933
				L.	.25	.85	.50	.85+	
43.	Dec. 3, '26	56	5	R.	.50	.50+	.30	.40—	1931
				L.	.50	.60	.50	.40—	
44.	Sep. 19, '30	52	3	R.	Complete Cataract				1932
				L.	.30	.40	.50+	.50+	
45.	Sep. 9, '26	50	7	R.	.85+	1.00—	.60	.85+	1933
				L.	.85+	1.00—	.85+	.85+	
46.	Oct. 8, '29	41	5	R.	.50+	.85+	.50	.85+	1933
				L.	.30	.85+	.50	.85+	
47.	Aug. 22, '29	41	5	R.	.12	.50+	.18	.85+	1931
				L.	.85	.85+	.85	1.00	
48.	Mar. 18, '29	30	3	R.	.85+	.85+	1.00	1.00	1932
				L.	.85+	.85+	1.00—	1.00	
49.	Mar. 2, '26	43	3	R.	.30+	.85	.50—	.85+	1930
				L.	.40+	.85	.60+	.85+	
50.	Aug. 28, '28	47	2	R.	.18	.50—	.18	.50	1931
				L.	.60	.85—	.60	.85	
51.	Apr. 10, '28	52	3	R.	.60	.85+	.85	1.00	1929
				L.	.60	.85+	.85	.85+	
52.	Sep. 14, '26	71	5	R.	.40	.60	.40—	.85	1930
				L.	.30	.60	.25+	.50+	
53.	May 3, '27	57	5	R.	.85+	.85+	.30+	1.00+	1932
				L.	.85+	.85+	.25+	1.00+	
54.	Nov. 23, '27	48	3	R.	.08+	.85+	.12	.85+	1930
				L.	.25	.85+	.30+	.85+	
55.	May 26, '27	82	6	R.	.25	.60	.18	.60—	1932
				L.	.25	.30	—	.40	
56.	Feb. 11, '29	55	5	R.	.25	.85	.18+	1.00—	1932
				L.	.25	.85	.25	.85+	
57.	Sep. 3, '26	55	6	R.	.50	.85	.50—	1.00	1932
				L.	.60	.60	.60—	1.00	

CASE	CASE STARTED WITH RED-FREE LENSES	AGE	Number of Examinations	Visual Acuity without Rx. at First Examination	Visual Acuity with Red-Free Rx. at First Examination	Visual Acuity without Rx. at Last Examination	Visual Acuity with Red-Free Rx. at Last Examination	Year of Last Examination
58.	Jan 30, '30	71	3	R. .60 L. .60	.85+ 1.00—	.85 .85	1.00 1.00	1932
59.	Mar. 4, '27	38	2	R. .50 L. .50	.85 .85	.40 .30	1.00 1.00	1930
60.	Dec. 6, '26	48	3	R. .85+ L. .50+	.85+ .85—	.30— .30—	.30 .30+	1932
61.	Jan. 4, '26	36	6	R. .85 L. .25	1.00 .25	1.25 .25	1.25+ .25	1932
62.	May 20, '30	48	2	R. .85— L. 1.00	.85 .85+	.85— 1.00	.85+ .85+	1932
63.	Nov. 15, '27	37	4	R. .85+ L. .85+	.85+ .85+	1.00— 1.00—	1.00 1.00	1931
64.	Mar. 17, '26	35	5	R. .85 L. .85	.85 .85	.85 .85	.85+ .85+	1931
65.	Sep. 22, '27	75	5	R. — L. —	.85— .85—	— —	.85— .85	1931
66.	Dec. 7, '26	68	5	R. .08 L. .12	.85 .85—	.12 .08	1.00— 1.00—	1932
67.	Apr. 18, '29	32	3	R. .85 L. .85	1.00— 1.00—	.85+ 1.00—	1.00— 1.00—	1931
68.	Oct. 14, '29	40	4	R. .85 L. .85	.85+ .85+	.85+ .85+	.85+ .85+	1932
69.	Mar. 9, '31	79	2	R. .12 L. .12	.85 .85	.30 .08	.85 .85	1931
70.	Jan. 19, '26	40	6	R. .85 L. .60	.85— .85—	1.00 .60	1.00 .85	1932
71.	Mar. 18, '26	36	5	R. .60 L. .60	1.00— 1.00—	1.00 1.00	1.00 1.00	1930
72.	Apr. 24, '31	76	2	R. — L. —	.60 .60—	— —	.30 .30	1932
73.	Dec. 3, '29	66	2	R. .40 L. .50	.85— .85—	.25+ .25+	.25+ .60+	1933
74.	Jun. 21, '26	48	5	R. .85 L. .85	.60+ .85+	.60+ .85—	1.00 1.00	1932
75.	Apr. 6, '31	43	3	R. .40+ L. .40+	.85+ .85+	.25— .40—	.85+ .85+	1932
76.	Jan. 31, '28	46	8	R. .85+ L. .85+	.85+ .85+	.50 .85	1.00— 1.00—	1933

CASE	CASE STARTED WITH RED-FREE LENSES	AGE	Number of Examinations	Visual Acuity without Rx. at First Examination	Visual Acuity with Red-Free Rx. at First Examination	Visual Acuity without Rx. at Last Examination	Visual Acuity with Red-Free Rx. at Last Examination	Year of Last Examination
77.	Mar. 18, '29	73	5	R. .12 L. .50—	.40 .85—	.18 .12	.85— .85—	1933
78.	Sep. 13, '29	23	6	R. .85 L. .85+	.85+ .85+	.85+ .85+	1.00 1.00	1933
79.	Jan. 28, '26	61	11	R. — L. —	.85 .85+	.12 .18	.85+ .85	1933
80.	Oct. 15, '25	65	8	R. — L. .30	.85 .85—	.25— .25+	1.00— .85+	1933
81.	Jan. 9, '30	52	4	R. .85 L. .85	1.00— 1.00—	1.00— .85+	1.00 1.00	1933
82.	Apr. 24, '28	38	6	R. .85— L. .85	.85+ .85+	.30 .40	.85+ .85+	1933
83.	Mar. 20, '26	54	11	R. — L. —	.85 .85	— —	.85 .85	1933
84.	Jun. 23, '30	64	3	R. .85— L. .60+	.85 .85	.60+ .50	1.00— 1.00—	1932
85.	May 6, '32	27	4	R. .85+ L. .25	.85+ .30	1.00— .30	1.00— .30	1933
86.	Dec. 7, '28	56	7	R. .60— L. .25—	1.00+ 1.00+	.50— .12	.85+ .85+	1933
87.	Oct. 22, '25	36	7	R. — L. —	1.00 .30	.50+ —	.85+ .30+	1933
88.	May 13, '29	40	6	R. .30 L. .25	.50 .50	.40— .40—	.85+ .85+	1933
89.	Apr. 21, '30	78	6	R. — L. .08	.85— .85—	— —	1.00— .85—	1933
90.	Apr. 30, '26	41	8	R. .30 L. .40	1.00— 1.00—	.50 .60	.85 .85	1933
91.	Mar. 16, '26	55	4	R. .60 L. .50	.85 .85	.85 .60	.85 .85	1933
92.	Apr. 8, '30	31	4	R. .85 L. .85	.85 .85	.85 .85	1.00— 1.00—	1933
93.	Mar. 1, '32	43	2	R. 1.00— L. 1.00—	1.00 1.00	1.00— 1.00—	1.00 1.00	1933
94.	Mar. 10, '31	51	2	R. .25 L. .12	1.00 .85	— —	1.00— .85+	1932
95.	Dec. 7, '28	36	3	R. .85 L. .85	1.00 1.00	.85+ .85+	1.00 1.00	1933

CASE	CASE STARTED WITH RED-FREE LENSES	AGE	Number of Examinations	Visual Acuity without Rx. at First Examination	Visual Acuity with Red-Free Rx. at First Examination	Visual Acuity without Rx. at Last Examination	Visual Acuity with Red-Free Rx. at Last Examination	Year of Last Examination
96.	Nov. 9, '27	50	8	R. .85 L. .85+	.85 .85+	.50 .60	1.00 1.00	1933
97.	May 3, '26	55	7	R. .30 L. .12	.85 .60+	.18 .08	.85 .40	1933
98.	Dec. 11, '25	50	3	R. 1.00— L. 1.00	1.00 1.00	1.00 1.00—	1.00+ 1.00	1932
99.	Aug. 30, '26	57	5	R. .50 L. .50	.85 .85	.12 .12	.85+ .85+	1933
100.	Mar. 17, '27	50	6	R. .40+ L. .50—	.85 .85	.50— .50	1.00— 1.00—	1933

DRS. E. LEROY RYER AND ELMER E. HOTALING,
NINE EAST 46TH ST.,
NEW YORK, N. Y.

SUB-NORMAL VISION FROM INFANCY: A CASE REPORT*

Charles E. Jaeckle, B. S., O. D., F. A. A. O.
Newark, New Jersey

This case has been of interest because it has afforded the opportunity of observing the development of vison in an individual of sufficient age and intelligence to be able to report his experiences, and who prior to coming under our observation had had no useful vision at any time.

Observations and Findings

M. H., age 17, was brought to us in the Essex County Optometric Clinic, February 4, 1932, and was examined by Dr. John A. Steeve and by the writer. An orphan, the patient had been an inmate of an institution for the blind for over 15 years. He was led into the room, being unable to go about alone except in quarters with which he was thoroughly familiar. He could not read even the largest newspaper headlines. In fact, he knew only a few letters of the alphabet and a few numbers. He had had no regular schooling, but had gone as far as the third grade in the school for the blind of the institution in which he resided. He spoke highly of the care he received there but said that he wished, if possible, to see well enough to go to live on a farm.

History: Sore eyes in infancy; surgical interference after which light perception was achieved; admitted to institution at 17 months. Frequent ocular examinations, lenses tried but never prescribed; no persistent or successful treatment. As result of past experience the patient's attitude toward the doctors in the clinic was non-co-operative, challenging. Almost cynically, he expected failure.

The right eye is totally blind—there being not even light perception, due to total spherical staphyloma. All that follows in this report applies to the left eye. Vision was finger count at ten inches, or 1/200 under standard illumination, 2/200 under increased illumination. (The letter used, "E," was, fortunately, one the patient knew.)

There is a partial conical staphyloma of the left cornea, apex

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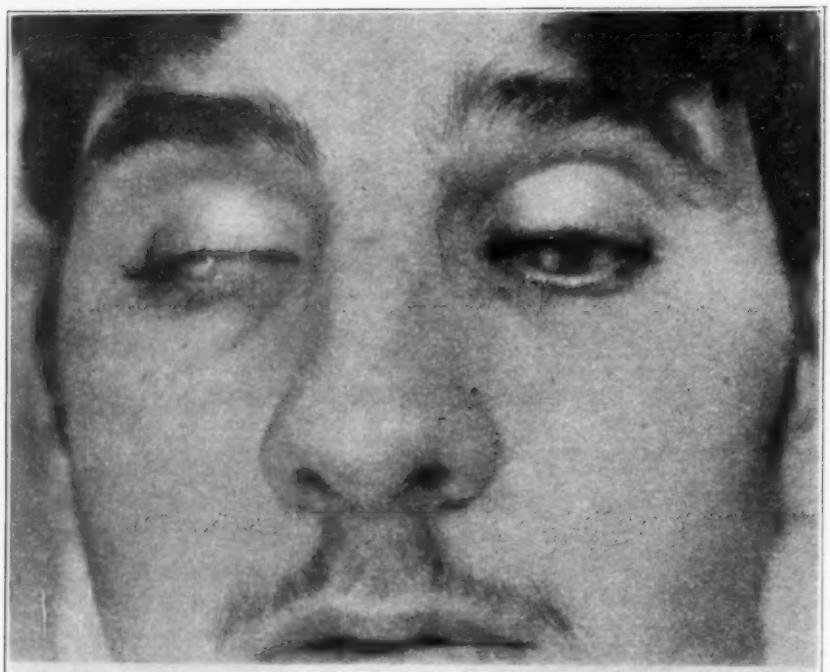
*An abridgement of the material presented before the American Academy of Optometry at Baltimore, December 17th, 1933.



Dr Charles E.Jaeckle. Figure 1. Patient at the start of the treatment period.

slightly infero nasally of the corneal vertex, with anterior synechiae. A relatively clear portion of cornea, about one-sixth normal cornea in area, is situated supero-temporally, and almost directly behind this is situated the irregular pupil. No crystalline lens could be seen on examination, suggesting a luxation. There are floating opacities of the vitreous and disseminated old choroido-retinal lesions. Much of the fundus is indeterminate and no small part of retina not exhibiting lesions can be discerned. Thus it will be seen that there is an involvement of every tissue in the eye.

Retinoscopy: Accurate quantitative findings not possible due to iregularity of reflex; about + 12.00 D. Sph. Fixation practically nonexistent. Nystagmoid searching movements (referred to by patient as "eye dazzling"), also searching movements of head, wide and varied. No subjective reaction to interposition of lenses before eyes (sphere, cylinder and sphero-cylinder in high amounts), except to draw from the patient the voluntary comment that the lenses "made things too

bright;" "hurt" eye. Patient non-cooperative (see above). It was decided to try to gain his confidence at another visit.

2/11/32.

Same static and subjective findings. Unfavorable reaction to trial case pin hole, stenopaic slits and multiple pin hole devices.

2/16/32.

Subjective refraction with telescopic element, Feinbloom technique: O. S. + 14.00 D. Sph. ⊃ T. S. 1.8x = 10/200, patient squinting lids together. V. A. with multiple pin hole spectacles, squinting, 4/200.

2/25/32.

Subjective refraction as above: O. S. + 15.00 D. Sph. Consultation with Dr. William Feinbloom. Patient's attention directed to objects. With correction, recognized lamp and telephone on desk at 6 to 7 feet; without correction, at about 2 feet. With correction, distinguishes men from women at 40 to 50 feet; without correction, at much less and varied distances, depending on other circumstances.

Prescribed: O. D. Cosmetically similar to O. S.
O. S. + 15.00 D. Sph.

Patient being seen about once weekly at office. Time, 2 to 5 hours each visit; examination, observation and visual training. The body of this report from this point consists of excerpts from the notes made at each visit.

3/8/32.

M. has had his correction five days. He can distinguish male from female characters in large well-defined magazine pictures; reports seeing cracks in sidewalk on way to office today; very elated over this. Ordered: study magazine pictures.

3/15/32.

V. A. (hereafter with Rx unless otherwise indicated) 5/200. M. saw priest at altar this week for first time. He has begun to compare pictures. Ordered: trace large letters and study pictures.

3/22/32.

V. A. 8/200; with Rx ⊃ T. S. 1.8x 10/120. Tracings of past week poor. Ordered: fill in letters with colored pencils.

3/29/32.

V. A. 10/200. Identified a woman at 90 feet, telegraph pole at 120 feet. With + 20.00 D. Sph. ⊃ T. S. identified lamp on pole at 120 feet and telegraph wires at 50 to 100 feet. Ordered: learn to recognize visual alphabet in script (given school penmanship charts of type hung on walls); learn to recognize block letters (cut-up Snellen chart), by studying at near.

4/12/32.

Recognized most of Snellen chart, all sizes, at 10 inches. Subjective, + 18.00 D. Sph. Same V. A. as correction. Deciphered words "NEXT WEEK" in 6 mm. block letters.

4/22/32.

Both patient and his uncle who has been bringing M. to office says he sees much better. Distinguished fare box cord in street car, noted its swinging motion, distance about 25 feet. Reports that eyes do not "dazzle" so much, "hold still" and feel more comfortable. Inspection confirms reduction in amplitude of nystagmoid movements.

4/26/32.

M. remarked, "If a small piece of cotton was dropped on the floor behind my back, I would be able to find it and pick it up," whereas this would have been impossible before beginning treatment. He is now able to distinguish priests from altar boys by vestments, and can see if someone leaves altar. Previously, knew of their presence and their number only by sound.

M. drew block letters "H" and "M."

5/3/32.

First response to our repeated urging that M. attempt to recognize people by *sight* instead of *sound*. Reports he can now recognize four or five acquaintances in institution. Described three:

1. Man of fifty: "dark complected, hair gray with brown spot in back."
2. Man of seventy: "almost entirely bald, upright posture, fairly dark."
3. Man of twenty-three: "pale, short—about 4 feet."

Printed name: MATTHEW. "First time I ever wrote my name." Practiced "printing" letters.

5/5/32

V. A. with + 16.00 D. Sph. to + 20.00 D. Sph. ⊃ T. S. = V. A. 10/100.

5/10/32

M. can distinguish an airplane in the sky as a cross; previously, merely a silver bead in air. "Beginning to see things farther away but cannot recognize them."

5/24/32

The patient tells us he saw small object "stuck in fence" 20 feet away, thought "maybe it was piece of cloth"; approached, heard it chirp and knew it for a bird; studied it for a few minutes before it took flight; previously, had never observed bird except in motion.

6/7/32

Patient can *write* numbers, except 8; "prints" letters. Wrote columns of numbers and added them. Correctly counted fingers average

2 out of 3 times at distance of 15 feet, ordinary room illumination, with + 15.00 D. Sph. ⊃ T. S.

6/9/32

M. reports that he identifies birds now, easily, in flight "which is smooth," whereas paper blown in wind moves irregularly. Identified color of orange and of green objects in room: recognition of green indicative of sensitive retinal area within 15° of macula.

6/28/32

Patient counted steps of house 50 feet away.

Subjective O. S. + 18.00 D. Sph. = 10/200 (Subjective varies, sometimes indicating cylinder or prism, but not consistently).

7/12/32

Light perception field by confrontation with uncovered retinoscope lamp: conforms to normal form field. Patient permitted to walk about office with telescopic correction (1.8x sphere) in trial frame. "Better than own glasses." Patient was taken for practice walk, at side of guide, outdoors; frequent stops to decipher signs. Discerned flag on top of 34 story building—flag appeared to be "ball on a stick." Evinced great interest in actions of gardeners in park. The first of many such walks. Next seen

8/23/32

M. is taking an interest in the color of clothes—expressed preference for brown or blue for himself. He attempted, without success, to read numbers of passing street cars. Note on inferior field: M. observed and stopped to read 7-inch white tile letters set in sidewalk. The patient walked unguided by touch except in heavy pedestrian traffic and at crossings.

8/30/32

M. is becoming very observant; remarked on condition of lawns, noticed lettering on garage mechanic's jumper, for example. Recognized a sign of a very common type as the same one he had studied a week ago. Can distinguish between demi-amber and dark zylonite spectacle frames on face; former causes annoying "bright spots" in peripheral field.

9/13/32

M. has been drawing lines on paper (ruling of ordinary ruled paper is not heavy enough for him to see) and drawing letters, on office visits for several months. Dr. H. Leslie Salov, who was present, supervised the visual training today. Patient was able to erase a line fairly accurately.

He expressed a desire to write the social worker who arranged for his admission to the clinic.

He has, for several weeks, been placed on the street car in one city and met at the car in the other city, in traveling between the institution

and the office. Today he will find his way from the car to the institution alone.

9/20/32

Today the patient brought with him two sheets of Braille on which he had written a letter of his own composition. A copy was made as he read this, then he wrote the letter in pencil as it was dictated to him. (Photostatic copy attached.) Optical system used: + 28.00 D. Sph. ⊂ T. S. 1.8x; distance about 8 inches. (Time required 2¾ hours.)

M. was taken to lunch. It was necessary to cut his meat for him, but he broke his own bread and was persuaded to cream his coffee, strange things to him. In the institution, all food is prepared so that it need only be eaten.

He identified his street car corner by traffic signs on the pavement.

9/29/32

Observation and consultation with Doctor Feinbloom. Today the car operator carried M. past his destination and he missed the individual waiting for him. He found his way to the office alone. On a number of occasions since then he has come alone from the car to the office, in spite of the busy traffic. He identifies our office in a row of like buildings by a patch of cement on the steps.

10/4/32

Managed lunch better today. Patient was taken to motion-picture show. Vehicles easily identified, possibly by motion. In the feature picture, figures were not often identified, due to insufficient contrast as indicated by the fact that the patient identified most figures in the cartoon and closely followed the principals in the news reel of a prizefight; even the individual blows were followed and the point of impact noted.

10/11/32

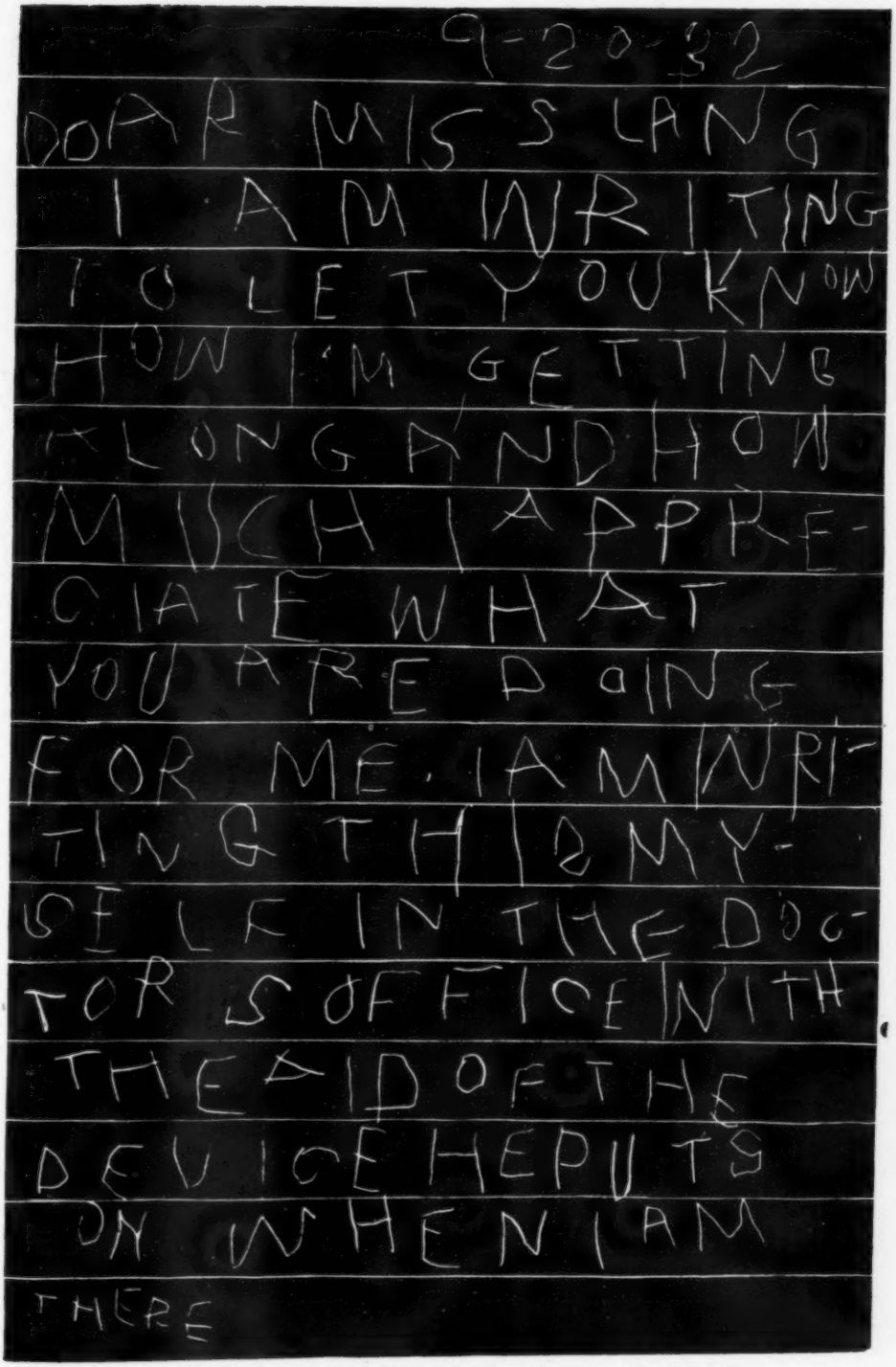
Visual training in- and out-doors. Today, for the first time, M. remarked that the telescopic element made "things look near." Thus it appears that it required a period of about nine months of use of the lens correction to establish a system of depth conception based on the particular visual experience obtained with the ophthalmic lens correction before the eye. Previous to this date, differences in size had been noted when the telescopic element had been added, but there was no difference in the localization of objects, a unique reaction in our experience.

Reading, or more accurately, deciphering of words printed in large capital letters in children's book attempted; tedious, but not impossible. Another problem to be met is that of quickening response to visual stimuli requiring unpremeditated action. Ball bouncing considered as exercise.

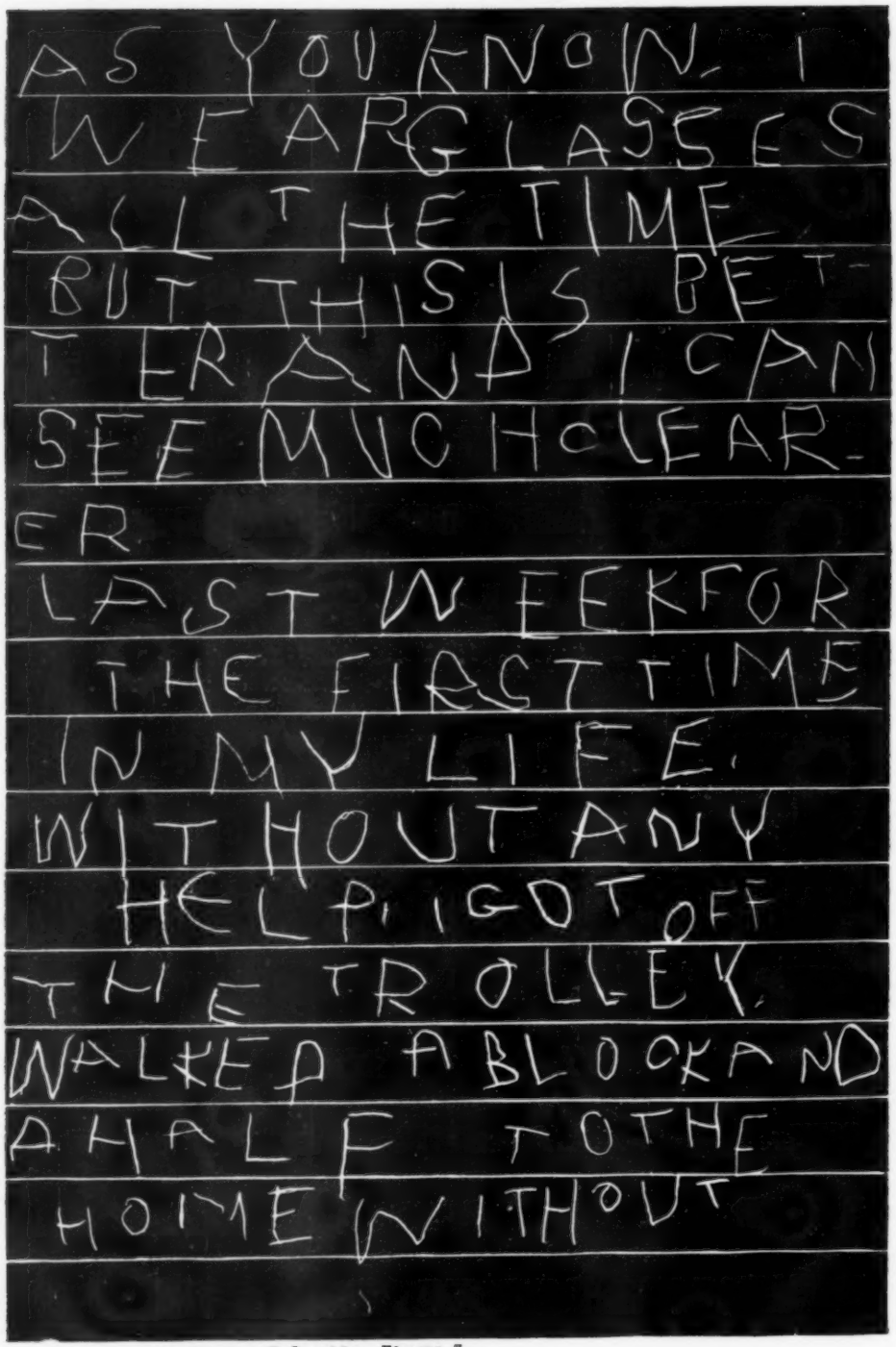
10/19/32

Medical examination—negative.

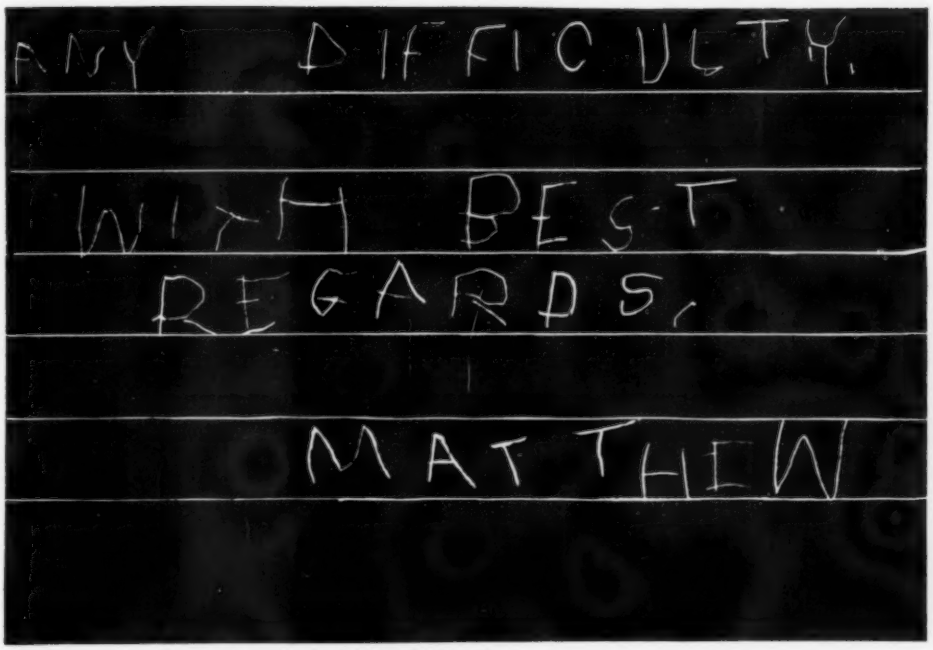
11/1/32



Dr Charles E. Jaeckle. Figure 2. This figure and those of figure 3 and 4 are a reproduction of a letter writen by the patient on September 20th 1932 by the aid of his new telescopic spectacles.



Dr Charles E.Jaeckle. Figure 3.



Dr Charles E. Jaeckle. Figure 4.

Psychological examination and consultation with Dr. Henry E. Starr, Psychological and Mental Hygiene Clinic, Rutgers University. Tests employed were designed to discount the patient's visual defect. General mental ability, dull normal, despite visual deficiency. "In terms of mental ability and emotional stability he appears to be quite capable of working satisfactorily on a farm." Need of developing a quick and adequate response to stimuli requiring unpremeditated action—particularly, unexpected stimuli—and means of developing this response considered. Exercise such as ball bouncing and broader supervised experience in actual life situations discussed. We feel M. will be ready for more than mere walking and reading shortly after he gets the telescopic spectacles we are now designing for him. As the telescopic spectacles of 1.8x magnification are now being constructed, it would be necessary to add a rear lens (behind ocular) + 17.00 D. Sph. for total refracting power + 20.00 diopters which would be inconvenient and undesirable in certain respects. The cost of construction of a special system designed differently from those available would be prohibitive in this case.

11/15/32

Patient has been practicing bouncing ball for the past week; feels he has made great strides; "can now catch ball on the bounce, but not when it is thrown through the air."

11/30/32

M. says he has become expert with the ball. Practiced reading.

12/7/32

We have decided to refract the patient with the telescopic element in place, adding plus spheres in front of element. This will result in lens reduction in magnification. Best results obtained with + 6.50 D. Sph. V. A. 10/120. A front addition of + 6.50 D. Sph. is approximately equivalent to a rear addition of + 18.00 D. Sph. Subjective findings have varied from + 18.00 D. Sph. to + 20.00 D. Sph. Standard front lens additions were available in + 6.00 D. Sph. and + 7.00 D. Sph. powers. It was decided to order the telescopic spectacles with + 7.00 D. Sph. front addition.

Patient is anxious to have telescopic correction; fears vision is diminishing. M. became increasingly convinced of this in the next two weeks.

12/19/32

Dr. Leslie Salov was again present and took the patient for a walk through the park. He read the lettering on a statue and commented on the chain fence around the statue.

12/24/32

Today M. received his telescopic spectacles. Only a talking motion-picture could convey a true impression of the patient's reactions. He walked about the office, excitedly inspecting and exclaiming over the pictures on the walls, the furnishings, other people in room. He was taken for a walk downtown where he selected a few Christmas cards (he inspected these, although he could not, of course, see them clearly with the distance telescopic spectacles). He evinced an almost child-like curiosity towards and interest in the Salvation Army Santa Claus, studying him critically. M. remarked about the glasses and added, "Are you going to let me take them home? Gee, I only hope you're going to let me take them home." This we permitted him to do, explaining that these glasses were not for near vision. The depression in the patient's spirits has lifted.

V. A. with telescopic spectacles 10/80.

12/28/32

Patient reported; cannot eat with new glasses on. Cannot see to the side, or below when walking. The light coming from the temporal field, behind lenses is annoying. The glasses are fine, however, and better than old glasses for distance vision and walking, in spite of the difficulties.

1/11/33

Near point visual training with telescopic correction and front reading adds. Today M. started to learn the alphabet in lower case type as well as capitals, by reading Feinbloom Sub-normal Vision reading card and alphabet story book.

1/18/33

Reading add + 9.00 D. Sph. (total front addition + 16.00 D. Sph.): deciphers 2F, with great difficulty and after repeated urging. As the patient did not know more than a few lower case letters, it was necessary for him to describe them. This was difficult, and the patient became recalcitrant, insisting he could not see the letters. We carefully explained the real difficulty to him and when we made him read numbers one-quarter the size of the letters, comprehension dawned upon him and he finally was convinced he could learn to read the letters too. This was a crisis in his learning to see.

2/27/33

Has completed reading alphabet book.

3/6/33

Begins reading primer. We are only occasionally devoting time to practicing writing. Skill in this art ceased to show progress some time ago. It can be practiced only in the office (at the institution there is no provision for visual education). It is believed that the time will be more effectively spent in reading until vision has improved further. Patient is reading more fluently now. For a long time he used to spell out loud each word. The front reading addition has been obtained and M. has been reading his book during the week under the supervision of one of the sisters at the institution. Given left side shield for glasses.

3/13/33

Shield is proving helpful indoors; it requires the patient to always look through lens and thus insures consistency in the kind of retinal images the eye is receiving; but outdoors the shield must be removed to permit use of peripheral field.

3/28/33

It was decided to try a contact lens to permit correction with a wider field.

Inserted contact lens. 2% butyn solution and adrenalin 1:1000, on prescription of physician. With + 8.00 D. Sph., V. A. 10/200. Lens worn 15 minutes, no irritation; too loose fit, scleral flange projects beyond sclera; diameter of scleral section too great.

4/3/33

Inserted contact lens as before, with correction lens + 8.00 D. Sph.; time worn, one-half hour. Patient was taken for walk outdoors. Walking much easier than with any other correction used to date. (Further study of the use of contact lenses in this case had to be postponed for lack of funds.)

4/21/33

Pinhole disc held behind telescopic spectacles improved visual acuity at near and increased range of relatively clear vision, but reduced field.

5/15/33

We took M. out in the woods and fields. He followed paths and avoided obstacles with almost no difficulty, walking alone, in advance. On the basis of his ability to get along which he demonstrated today, we decided to arrange for a period of supervised outdoor experience in a boys' camp, as training for farm life.

6/20/33

The patient is now reading second grade reader, under guidance of Dr. Frederick W. Hanle.

7/22/33

M. starts two weeks' camping experience under doctor's supervision.

8/5/33

During the camp experience, the patient improved in every way. He learned to get along with others, to take care of himself in the buildings or out in the fields, to handle his food with no assistance. This increased ability to react adequately to visual stimuli and to adapt himself to ordinary psychological and physical situations encountered in living with other normal individuals, was the result we sought and obtained. This part of the treatment was undertaken in line with a remark Doctor Feinbloom made one day when we asked what we could do to improve the patient's vision. The answer was, "Live with him."

8/16/33

Reading progress continues to time of this report, patient often being in the care of Dr. Hanle.

10/30/33

The vision with telescopic spectacles has not changed over last notation, nor has the vision with the single sphere correction. The naked vision, however, has improved definitely over the finding at the time of admission to the clinic.

Summary:

Date	Rx	V. A.
February 16, 1932	No Rx	1/200
	Rx + 18 D. S.	5/200
	T. S. 1.8x	10/200
October 30, 1933.....	No Rx	3.5/200
	Rx + 18 D. S.	10/200
	T. S. 1.8x	10/80

Reads with T. S. 1:8x or 2.2x to 5F.

The Feinbloom 2.2x telescopic spectacle element further improves vision. Observation of the case will be continued, employing the spherical and cylindrical telescopes as well as contact lenses. We do not look

for much change in the actual distance acuity. The important thing is the patient's improved response to life about him.

Conclusion:

This case has been presented in great detail, in the belief that this, better than anything else we might say, will emphasize the fact that the care and treatment of Sub-normal Vision cases is a psychological and sociological problem, yet one with which only an optometrist can deal.

DR. CHARLES E. JAECKLE,
28 JAMES STREET,
NEWARK, N. J.

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EDITORS

DR. CAREL C. KOCH
1501 Foshay Tower
821 Marquette Avenue
Minneapolis, Minn.

DR. JACK I. KURTZ
1501 Foshay Tower
821 Marquette Avenue
Minneapolis, Minn.

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THE OPTOMETRIC PHYSICAL THERAPIST

One can trace the history of physical therapy back to the early Egyptians, Greeks and Romans who were all believers in the sun's rays as an agent of therapeutic value to man. As civilization developed in a technical sense, the therapeutic use of heat, massage and exercise were gradually introduced. Then came the World War, which added much to our knowledge of the value of these aids in the successful treatment of various disorders. During the decade following the war, great advances were made in the use of physical agents and much of the finer electrical equipment now available for every need, was developed.

Perhaps it would be well to define the term physical therapy. Physical therapy is a term employed to describe the treatment of various disorders of the human system by mechanical means. It comprises the use of physical, chemical and other properties of heat, light, electricity, exercise and massage. As this applies to optometry, it is the beneficial application of these agents, in those ocular cases where there are certain definite indications for the use of one or more of these physical agents, in the correction of the existing ocular abnormality. An optometrist using

physical therapy should be a graduate who has had special training and who has acquired skill in the therapeutic use of these methods.

In optometry the use of physical therapy is limited to those refractive and abnormal neurological cases wherein imbalances of the accomodative-convergence function are encountered. In these cases the optometric physical therapist, like any other specialist, does not and cannot perform miracles. His training and his experience in this specialty teach him the limitations, indications and contra-indications of optometric physical therapy.

It is only by painstaking study and arduous labor that the optometrist learns and imparts to his fellow specialists the results of newer investigations in this field and at this time we find it particularly encouraging as during last month a group of optometric physical therapists met in Ohio at the first large annual gathering of optometrists who specialize in one of the phases of this specialty. We find this encouraging not only because these men are developing new technics which may enable us to more readily treat certain refractive abnormalities but they are also interested in developing special graduate courses necessary for satisfactory training in the specialty.

While no one claims they have entirely mastered the subject, nevertheless as optometrists we have passed the experimental stage and have established optometric physical therapy upon a firm foundation. In the short time since this method of treatment has come to the fore in ocular refractive work, we have accomplished a great deal. That the optometric profession as a whole does not accept it as a specialty is lamentable. This is probably due, in part, to some, confusing these ocular treatments with other types of therapeutic work. Others condemn it because of the preposterous claims, made in former years, by optometrists and others who early became overenthusiastic. Then too, there are still the minority who simply refuse to recognize the progress which the scientific optometric physical therapist has been making. There is no question of encroaching upon the sacred [sic] ground of various other professions. Ocular refractive work and the correction of the neuro-muscular involvements of the extra-ocular muscles and of accommodation are primarily the work of the optometrist, and technics which improve the optometrists ability to do this work must and should be encouraged. C. C. K.

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A CORRECTION

In the article entitled *Functional Eye Strain* which appeared in the March, 1935 issue of the AMERICAN JOURNAL OF OPTOMETRY by Dr. F. E. Holder, the author quoted at length from a similar paper by the same name written by Dr. Fred C. LaGrange and published in the JOURNAL OF THE IOWA STATE MEDICAL SOCIETY, March 10, 1925. Credit which should have been given Dr. LaGrange was omitted.

STRABISMUS ITS RE-EDUCATION: THE PHYSIOLOGY AND PATHOLOGY OF BINOCULAR VISION. A. Contonnet and J. Filliozat. Translated from the French by Dr. Max Coque. Published by M. Wiseman & Co., 72 Leather Lane, London, England. First edition 379 pages, 83 illustrations. Cloth binding. 1934.

The authors of "Strabismus" approached this subject from a clinical standpoint. The treatment of strabismus by re-education is of French origin. The three men who have done much in their day to develop this technic are Javal, Parinaud, and Renny. The authors of this book have elaborated upon and refined the techniques of these men. They also perfected new technique of their own.

Normal eyes, the authors hold, have a two fold function: Focusing and depth perception and when either one of these two functions are abnormal discomfort will result.

The book "Strabismus" is divided into three parts. The first part is given to an extensive discussion of "Physiology of Binocular Vision." The subjects contained in this part are: Normal and Abnormal Binocular Vision, Perception of Relief in Monocular and Binocular Vision. Tests for binocular vision, for simultaneous vision and for stereoscopic vision. Particular attention is given to the role played by the dominant eye. The dominancy is classified as: (1) "Heterovalence," i.e., when one eye (the same) is always dominant. (2) "Homovalance" without predominance of one eye. (3) Alternating predominance of the two eyes. (4) Transitional and mixed forms.

The second part of the book covers abnormal Binocular Vision. The possible causes of the different types of heterophorias are discussed at length and method of diagnosing and treatment are given. The authors introduce some new terminology which is not used in this country, "neutralization in strabismus" is one of them. This is a phenomenon by which the image formed on the retina does not give rise to a conscious perception, i.e., "a visual sensation. "This corresponds to the phenomenon "inhibition" as used by the psychologists. Neutralization is classified as: complete and incomplete, total or partial, permanent and temporary.

In discussing the relation of nystagmus to strabismus they claim most cases of nystragmus are caused by the condition of strabismus and when the latter is cured the nystagmus disappears. The third part is given to the "Re-education of Squinters." A classification of the types of squinters is given and the types that will benefit by re-education treatment is indicated. Fully seventy per cent of squinters they claim will improve by this method of treatment. The various types of exercises to be used in the treatment of squint are described. Great stress is laid upon the important part the psychological factor plays in the treatment of squint and the clinician is urged to utilize this factor to the fullest extent.

The book, "Strabismus," contains much valuable information for one interested in this subject. —J. I. K.